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## (54) IMPROVEMENTS IN OR RELATING TO ROCK DRILLS

(71) We, H. REINHOLDT A/S of 29-31 Rugmarken, 3520 Farum, Denmark, a Danish Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a rock drill for rotary percussion drilling machines and concerns a convenient and advantageous shaping of such a drill.

Rock drills are already known in a variety of constructions to suit varying working conditions. In order to conduct away the swarf produced during drilling, it has been proposed, for example, to construct a discharge groove which is cut helically from a previously cylindrical portion in such a manner that its wall which faces towards the end of the drill adapted to be clamped in the drilling machine is cut back with respect to the previously cylindrical portion. Since only one discharge groove is provided for transporting the large amount of swarf generated more particularly during percussion twist drilling, where two cutting edges operate at the tip of the drill, jamming of the drill frequently occurs with this drill construction due to insufficient discharge of the swarf. Also precise guidance of the drill is not obtained, more particularly upon presentation and for small hole depths, because due to the single discharge groove the circumferential surface of the drill which contacts the drill hole is in contact at only one point in any cross-sectional plane, so that skewing of the drill frequently results and there is thus no warranty of accurate work. Excessive skewing can also lead to breakage of the drill.

Hitherto drills have also already been used for drilling in rock which, in order to improve the guidance and to make possible the maximum accuracy of work, resemble the twist drills known for metal working in their outer configuration. These drills each have two discharge grooves which are approximately semi-circular in cross-section, for the swarf removed by the drilling process. But since these twist drills have at their discharge grooves a pitch angle of approximately 60° with respect to the longitudinal axis of the drill, they have the disadvantage that when drilling vertical or almost vertical drill holes the drilling power diminishes considerably for hole depths of more than five times the drill diameter. Then due to the inadequate discharge of the drill cuttings the drill jams in the drill hole, so that it frequently has to be withdrawn in order to remove the drill cuttings, whereupon part of the drill cuttings slips back into the hole again, and continuous working therefore is not achieved.

It is therefore an object of the invention to produce an improved rock drill for rotary percussion drilling machines which is nevertheless simple in its shape and can therefore be manufactured without difficulty. It is a principal aim that good and rapid discharge of the drilling dust and rock fragments is ensured at all times with high working precision and extremely low hole friction, and that the drill is also accurately guided at all times even at small hole depths, so that the drive power is fully utilised and breakdowns due to jamming and skewing, with attendant risk of breakage, are virtually eliminated.

To this end, the present invention consists in a rock drill for rotary percussion drilling machines, wherein the drill is provided with two helical discharge grooves extending from a working tip, the grooves being cut from a previously cylindrical portion, those parts of the surface of the previously cylindrical portion remaining between the discharge grooves constituting two helical guide surfaces, and wherein each guide surface widens

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adjacent the working tip to substantially a quarter of the circumference of the previously cylindrical portion, a hard metal cutting insert being secured to the working tip of the drill.

It is particularly advantageous to provide the drill with a cylindrical core which is greater in diameter than half the diameter of the previously cylindrical portion.

In order to avoid peak stresses and cracks, it is further advantageous to round the discharge grooves in the region adjacent to the guide surfaces, preferably with a radius corresponding to a groove depth or with a greater radius.

A rock drill for rotary percussion drilling machines and constructed according to the invention is characterised not only by high service reliability and working precision including when drilling very deep holes, but above all it is ensured that the drilling dust and the rock fragments generated are discharged rapidly and without causing jamming and skewing of the drill, so that the drive power of the machine is fully utilised. Due to the fact that two discharge grooves are cut into the previously cylindrical circumferential portion to accommodate the drill cuttings, so that the remaining parts of the circumferential surface of the previously cylindrical portion can serve as guide surfaces, it is in fact ensured that even material generated in large quantities—e.g. when drilling in soft rock—can be accommodated immediately behind each cutting edge and discharged. The drill cuttings are thus discharged considerably better and more rapidly than in the case of the constructions hitherto known, while the friction at the drill tip is also reduced.

Furthermore, due to the working of two grooves into the previously cylindrical portion, good support against the cylindrical interior wall of the drill hole is ensured, since in every cross-section the drill is supported at two diametrally opposite points. Skewing and consequent breakage, more particularly at shallow drilling depths, are reliably obviated in this manner.

Due to the comparatively narrow guide surfaces of the drill, in conjunction with the comparatively wide discharge grooves, the friction in the drill hole is very considerably reduced compared to the drill constructions hitherto known, since a large space is always available for transporting the swarf and only the guide surfaces of the drill are in contact with the wall of the drill hole. In this case it is impossible for any compression of the drill cuttings to occur, on the contrary, it remains pulverous and is rapidly discharged out of the drill hole, while a greater helix angle can be chosen for the helical guide surfaces than hitherto, so that jamming of the drill is reliably prevented. The drive power of the drilling machine which can thus be fully utilised renders possible a high cutting speed and high working power with a rock drill constructed according to the invention.

In order that the invention may be more readily understood, reference is made to the accompanying drawings which illustrate diagrammatically and by way of example, two embodiments thereof, and in which:—

Fig. 1 shows a rock drill in elevation;

Fig. 2 shows part of the drill according to Fig. 1 in cross-section; and

Fig. 3 shows a modified cross-sectional shape of the rock drill according to Fig. 1.

Referring to Fig. 1, the rock drill 1 which is intended for clamping by its shank 2, in a drilling machine not shown, is tipped at the drilling head 5 with a hard metal plate 6 soldered to the head 5, and is provided with two helical discharge grooves 8 and 9 cut from a previously cylindrical portion 4. The angle of the helix is indicated by $\alpha$. The swarf which is separated by the cutting edges 7 of the hard metal plate 6 by rotation and axial percussion, and the rock fragments, are thus accommodated immediately behind the cutting edges 7 by one of the discharge grooves 8 or 9 and transported out of the drill hole, so that it is impossible for any compression of the swarf and skewing of the drill 1 to occur.

The discharge grooves 8 and 9 are constructed, as may be seen more particularly from Fig. 2, as comparatively wide recesses so that even large quantities of swarf can be accommodated and only a small part of the previously cylindrical portion 4 remains when the grooves 8 and 9 are cut. These parts act as narrow guide surfaces 10 and 11 by which the drill 1 is correctly supported at all times without skewing against the wall of the drill hole. The discharge grooves 8 and 9 are rounded in the regions 12 and 13 immediately adjoining the narrow guide surfaces 10 and 11 in order to avoid peak stresses and crack formation. The core 3 of the drill 1 is thus of cylindrical shape in cross-section between the grooves 8 and 9. In addition each narrow guide surface 10 and 11 widens at the drill head 5 to substantially a quarter of the circumference of the previously cylindrical portion 4. In this manner the guiding of the drill 1 is likewise improved, particularly in the case of comparatively shallow drill holes.

In the embodiment according to Fig. 3, the drill 31 is again provided with two helical discharge grooves 34 and 35 cut from a previously cylindrical portion 33. The discharge grooves 34 and 35 in this case are constructed so that the core 32 of the drill 31 is made conical in cross-section between the grooves 34 and 35. Due to the working of the two comparatively wide discharge

grooves 34 and 35, again two narrow guide surfaces 36 and 37 are produced, located diametrally opposite in every case, whereby an accurate guidance of the drill 31 against the drill hole wall is ensured with low hole friction.

WHAT WE CLAIM IS:—

1. A rock drill for rotary percussion drilling machines, wherein the drill is provided with two helical discharge grooves extending from a working tip, the grooves being cut from a previously cylindrical portion, those parts of the surface of the previously cylindrical portion remaining between the discharge grooves constituting two helical guide surfaces, and wherein each guide surface widens adjacent the working tip to substantially a quarter of the circumference of the previously cylindrical portion, a hard metal cutting insert being secured to the working tip of the drill.

2. Rock drill as claimed in claim 1, wherein the drill has a cylindrical core.

3. Rock drill as claimed in claim 2, wherein the diameter of the cylindrical core is greater than half the diameter of said previously cylindrical portion.

4. Rock drill as claimed in any of claims 1 to 3, wherein the discharge grooves are rounded in the region adjoining the guide surfaces, preferably with a radius corresponding to a groove depth or a greater radius.

5. A rock drill substantially as hereinbefore described and with reference to Figs. 1 and 2 or Fig. 3 of the accompanying drawings.

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This drawing is a reproduction of the Original on a reduced scale.

FIG.1

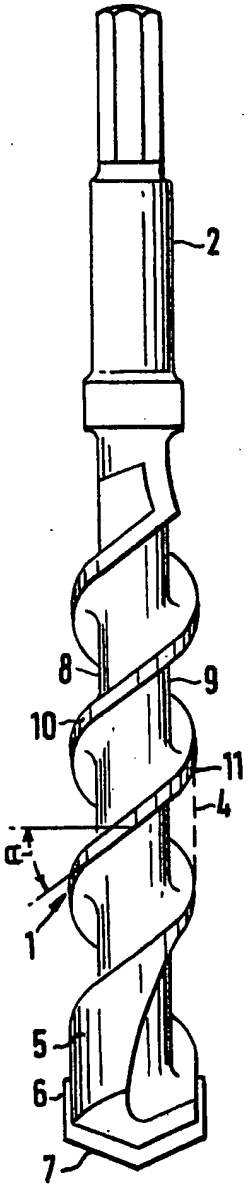


FIG. 3

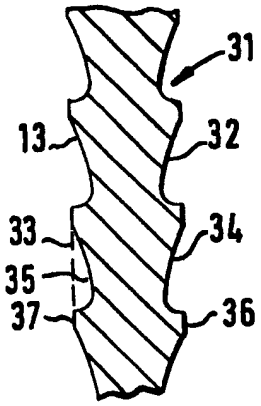


FIG. 2